

June 1987

NAVY MAINTENANCE

The P-3 Aircraft Overhaul Program Can Be Improved



National Security and
International Affairs Division

B-226749

June 26, 1987

The Honorable James H. Webb
The Secretary of the Navy

Dear Mr. Secretary:

We have completed a review of Navy procedures for overhauling P-3 aircraft. During fiscal year 1985, the Navy spent about \$50 million for such overhauls.

We found that the Navy could increase aircraft availability and reduce overhaul costs by (1) performing more inspections to determine if overhauls are necessary, (2) scheduling overhauls more efficiently, and (3) concentrating the labor force on fewer aircraft. We also found that the Navy has more production capacity than needed to overhaul P-3 aircraft. Our findings are summarized below and are discussed in greater detail in appendix I.

The Navy has established the Aircraft Service Period Adjustment program in which aircraft are inspected before they are due for overhauls to determine whether overhauls can be deferred for 12 months. Over half of the P-3 aircraft inspected under this program have passed inspection and have been allowed to continue in operation without overhauls. However, the major commands and their squadrons have not been requesting inspections on many aircraft. Of 68 P-3 aircraft sent to the depots for overhaul in fiscal year 1985, 30 had not been inspected. Had these aircraft been inspected and the historical rate of success been achieved, overhaul costs would have been reduced (each overhaul costs an average of \$715,000) and aircraft operational periods would have been increased.

The Naval Air Systems Command's Naval Aviation Logistics Center allocates projected aircraft overhauls among the depots on a quarterly basis. However, the major commands and their squadrons frequently request modifications to the quarterly schedule before actually delivering aircraft to the depots and the Logistics Center routinely approves them. The lack of adequate central control over aircraft deliveries has resulted in periods when aircraft have waited outside the depots for their turn to be overhauled and other periods when the overhaul capacity has been underutilized. In fiscal year 1985, P-3 aircraft waited an average of 2 weeks for overhauls to begin.

In performing overhauls, the depots spread available workers over as many aircraft as they can fit into a production line. If the depots were to concentrate the workers on fewer aircraft, they could finish work on each aircraft sooner and overhaul just as many aircraft over time. Faster overhauls would increase the time aircraft are available for operations.

The production lines at the two Navy depots and at the one commercial depot have the combined capacity to overhaul 134 P-3 aircraft annually. Since annual overhaul requirements are not expected to exceed 99 aircraft through the remainder of this century, the depots have a considerable amount of excess capacity. This excess capacity results in redundancies and unnecessary duplication in spare parts, supplies, and equipment, as well as in management, administrative, and other support costs.

To improve the P-3 aircraft overhaul program, we recommend that you:

- Require that all P-3 aircraft due for overhaul be inspected under the Aircraft Service Period Adjustment program unless an inspection exemption is specifically authorized.
- Direct that the Naval Aviation Logistics Center assume a more active role in coordinating actual deliveries of P-3 aircraft for overhaul so that each aircraft can be scheduled on a specific date to coincide with a depot's ability to begin work on that aircraft.
- Explore opportunities to reduce overhaul turnaround time by concentrating labor resources at the depots on as few P-3 aircraft as possible.
- Examine ways to eliminate excess P-3 aircraft overhaul capacity at the depots, perhaps by closing one of the three P-3 aircraft production lines.

We also recommend that you determine the feasibility of implementing the above recommendations on other aircraft. The P-3 aircraft has one of the shortest overhaul turnaround times among Navy aircraft and any procedural changes to reduce that time could have applicability to other aircraft.

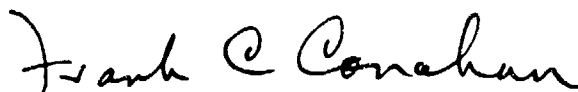
The Department of Defense (DOD) provided comments on a draft of this report. (See app. II.) With the exception of the excess capacity issue, DOD stated it generally agreed with our findings and recommendations and noted that corrective actions have been taken or are underway. DOD also stated that current management initiatives will help ensure that all aircraft production lines are operated effectively and efficiently.

On the capacity issue, DOD expressed the view that there is no excess P-3 overhaul capacity at the Alameda and Jacksonville depots. After reevaluating the matter, we still believe that a significant amount of excess P-3 capacity will continue to exist, particularly if the capacity at the contractor depot is considered. Our complete evaluation of DOD's comments is in appendix I.

As you know, 31 U.S.C. 720 requires the head of a federal agency to submit a written statement on actions taken on our recommendations to the Senate Committee on Governmental Affairs and the House Committee on Government Operations no later than 60 days after the date of the report and to the House and Senate Committees on Appropriations with the agency's first request for appropriations made more than 60 days after the date of the report.

We are sending copies of this report to the Chairmen of the above committees; the Chairmen, Senate and House Committees on Armed Services; the Secretary of Defense; and the Director, Office of Management and Budget.

Sincerely yours,

A handwritten signature in cursive script that reads "Frank C. Conahan".

Frank C. Conahan
Assistant Comptroller General

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DOD Department of Defense

Planning for P-3 Aircraft Overhauls

The P-3 is a shore-based, long-range aircraft designed to combat submarines. The Navy has 24 active P-3 squadrons, 13 reserve squadrons, and 5 squadrons for training and special projects. The P-3 inventory totals 441 aircraft.

During its 30-year life, a P-3 is expected to undergo six overhauls at one of two Naval Air Rework Facilities, also known as depots, located at Jacksonville, Florida, and Alameda, California, or at a commercial depot located at Lake City, Florida. To compensate for the time aircraft spend in a depot, the Navy purchases a number of aircraft beyond those it needs to have in operation at a given time. For the P-3 aircraft, the Navy has calculated that it needs an additional 10.6 percent aircraft to ensure it has enough aircraft to meet both operational and maintenance needs. With a total of 441 P-3s in inventory, this represents 399 P-3s in an operational status and 42 additional aircraft to sustain this operational level while aircraft are in the depots for overhauls.

The time an aircraft spends at a depot is called turnaround time. As the average turnaround time increases, the total number of aircraft needed to sustain a given number of operational aircraft also increases. For the P-3, if the average turnaround time increased by 3.5 days, one additional aircraft would have to be purchased, at a cost of about \$36 million, to assure that the average number of operational aircraft does not decrease.

Objective, Scope, and Methodology

Our objective was to determine whether the Navy could reduce depot overhaul turnaround time for the P-3 aircraft by improving overhaul procedures.

We visited the two Navy depots that overhaul the P-3 aircraft: the Alameda Naval Air Rework Facility and the Jacksonville Naval Air Rework Facility. At these depots, we interviewed P-3 aircraft production managers, foremen, engineers, schedulers, and planners and reviewed planning documents, such as production line layouts, work flow charts, induction and production schedules, critical path charts, and DoD and Navy directives and instructions.

We also visited two Navy headquarters activities. At the Naval Air Systems Command's Naval Aviation Logistics Center, we obtained data on aircraft turnaround times, mobilization requirements, and aircraft overhaul schedules. At the Office of the Deputy Chief of Naval Operations (Air Warfare), we obtained P-3 purchase costs and overhaul projections.

We compared (1) actual overhaul data, such as facility layouts, work flow, labor applications, and turnaround times, to the Navy's plan for overhauling P-3 aircraft, (2) alternative production line layouts and single-shift to multiple shift plans of operation, and (3) the combined capacity of the two Navy depots and the contractor depot to current and expected overhaul requirements.

Our review was made in accordance with generally accepted government auditing standards and was performed between April 1985 and December 1986.

Selecting Aircraft for Overhaul

P-3 aircraft are routinely considered for overhaul after operating for a specific number of months that ranges from 46 to 60 months, depending upon the age of the aircraft. The procedure for selecting a P-3 for overhaul begins at the squadron. Six months before a P-3 is due for overhaul, the squadron that has custody of the aircraft may request, through its major command, an inspection of the aircraft by qualified depot personnel to determine if the due date can be extended an additional 12 months. These inspections are done under the Navy's Aircraft Service Period Adjustment program. If the date is not extended, the squadron has the remaining 6 months, plus 3 months after the due date, to deliver the aircraft to one of the P-3 overhaul depots.

If a P-3 fails the inspection or if the squadron decides not to request an inspection, the squadron, again through its major command, notifies the Naval Aviation Logistics Center that it has an aircraft in need of an overhaul. The Logistics Center is responsible for scheduling aircraft into the depots for overhaul and for notifying the major command which depot will do the overhaul. Approximately 30 days before it expects to deliver the aircraft to the depot, the squadron provides the Logistics Center with the specific identification of the P-3 and the expected date of delivery. The squadron may later request that the delivery date be revised to accommodate changes in deployment schedules or overhaul priorities.

Inspections Needed to Ensure Overhauls Are Necessary

Many aircraft are not receiving advance inspections to determine if overhauls are necessary. Before an aircraft is due for overhaul, the Navy gives the squadron the option of having it inspected by qualified depot personnel to determine whether the overhaul can be postponed. Between January 1984, when inspections of most P-3 aircraft began under the Aircraft Service Period Adjustment program, and December

1985, depot personnel inspected 152 aircraft. Of this number, 85 aircraft (56 percent) were given 12 additional months to continue in operation without overhauls. Extending the time between overhauls reduces the average time that aircraft spend in a depot, which increases aircraft availability. Other benefits include (1) a reduction in requirements for depot overhaul capacity because as the number of additional aircraft needed to sustain the required level of operational aircraft decreases, fewer aircraft will require overhaul, and (2) one less overhaul for most P-3s because the accumulation of extension time may reduce the total number of overhauls from six to five over the 30-year service life of the P-3 aircraft.

Despite these benefits, not all aircraft were inspected by depot personnel before overhauls. During fiscal year 1985, the squadrons sent 68 P-3s to the depots for overhauls, of which 38 had been inspected. The remaining 30 P-3s were sent without assurance that overhauls were needed. If inspections had been performed and the historical rate of overhaul deferrals (56 percent) had been achieved, 17 of the 30 aircraft would have passed the inspections and remained in the squadron for another year. We have no reason to believe that the historical pass rate would not be realized on these aircraft.

Extending the time between overhauls for the 17 aircraft would have resulted in substantial cost savings. According to DOD, the cost of an Aircraft Service Period Adjustment program inspection is about \$15,000. In contrast, the average cost of an overhaul is \$715,000. Therefore, the Navy would have saved almost \$12 million in overhaul costs in fiscal year 1985 if these 17 aircraft had not been overhauled.

We asked command officials why they did not request preoverhaul inspections on all P-3 aircraft. They stated that, in some cases, the uninspected aircraft were in such obvious need of overhauls that inspections would have been a waste of funds. However, depot officials stated that the squadrons lack the expertise to decide whether an overhaul is necessary and that depot personnel are much better qualified to make this judgment. Moreover, the \$15,000 cost of an inspection is only about 2 percent of the cost of an overhaul. Consequently, the Navy would save funds even if only 1 out of 50 inspections resulted in deferring an overhaul.

In our draft report we stated that 35 of the 68 P-3s sent to the depots for overhaul in fiscal year 1985 had not been inspected. In commenting on our draft report, DOD stated that an additional 7 P-3s had been

inspected and provided reasons for not inspecting the remaining 28 aircraft. However, supporting documentation subsequently provided by DOD and the Navy activity responsible for worldwide maintenance of P-3 aircraft indicated that only five of the seven aircraft actually had been inspected. Therefore, we have revised our report to show that a total of 30 rather than 35 P-3s had not been inspected in fiscal year 1985.

In explaining why the 28 aircraft were not inspected, DOD noted that there are valid reasons for aircraft not to receive inspections prior to overhaul and that type commanders are allowed some operational flexibility. However, by June 1988, DOD plans to clarify policy guidance on when an inspection exception is authorized. Included in this guidance will be provisions for a short cut method to permit depot personnel to verify a type commander's decision that an inspection is unnecessary before sending an aircraft to a depot. We agree that clarifying guidance is needed and believe that it will be helpful in making exception decisions.

Overhauls Can Be Scheduled More Efficiently

The Naval Aviation Logistics Center could reduce the time that P-3s spend waiting at the depots for overhauls by taking more direct control over the overhaul scheduling process. Although aircraft are supposed to be delivered the day before the scheduled overhaul date, ineffective scheduling of overhauls caused P-3s to sit outside the hangars awaiting overhauls for an average of 2 weeks in fiscal year 1985. Increases in turnaround time increase the total number of aircraft needed to sustain the operational availability of aircraft to the squadrons.

The Logistics Center is responsible for scheduling aircraft overhauls at the depots. Through quarterly workload conferences with major commands and depots, it allocates projected overhauls among the depots on a quarterly basis. However, the major commands, such as Naval Air Force, Atlantic, and Naval Air Force, Pacific, and their squadrons frequently request modifications to the quarterly schedule before actually delivering aircraft to the depots. Logistics Center officials stated that they attempt to discourage modifications but normally approve any such requests.

The lack of adequate central control over actual aircraft deliveries has resulted in an uneven work flow and inefficiencies. The inefficiencies result because the depots are not able to optimize the intervals between incoming aircraft. Overhauls scheduled at less than optimal intervals cause aircraft to wait outside an overhaul facility for their turn to be

overhauled, while longer intervals cause workers to be less productive as they wait for aircraft to be delivered.

Aircraft arriving at Alameda experienced a considerable amount of waiting time. One reason for this condition was that funds were provided at the end of the fiscal year to perform additional overhauls, but Alameda did not have the capacity to handle this workload. During the last two quarters of fiscal year 1985, Alameda received 26 P-3s but only had a capacity to overhaul 19. These aircraft, which arrived at intervals ranging from one every 13 workdays to two on the same day, had to wait an average of 74 days before overhauls began. Without this waiting time, the squadrons would have had the continued use of those aircraft for over 2 additional months.

Conversely, Jacksonville received 18 P-3s during the last two quarters of fiscal year 1985 but had a capacity to overhaul 31. The aircraft arrived at intervals ranging from one every 19 workdays to one every 4 workdays. As a result, Jacksonville's production line operated at only 58 percent of capacity.

To minimize turnaround time, avoid backlogs, and ensure efficient scheduling of aircraft for overhaul, the Logistics Center needs to refine each delivery date as it approaches and determine the exact date that an aircraft should be delivered to a depot. Such factors as each aircraft's overhaul due date, a squadron's operational needs, each depot's capacity to begin work when the aircraft is delivered, and variances in work required on each aircraft should be considered.

For example, to avoid the backlogs at Alameda, the Logistics Center could have scheduled more overhauls at Jacksonville. Or, since these aircraft were still capable of operating, the Logistics Center could have told the squadrons to continue using the P-3s until an opening in the production line occurred. In fact, one P-3 was pulled from the waiting line and deployed to the Pacific Area because the squadron could not wait for the overhaul.

In commenting on our draft report, DOD stated that the scheduling problems we identified have been corrected and that the Navy is placing appropriate emphasis on each depot's capacity to begin work and the other factors needed for efficient scheduling. According to DOD, all P-3 aircraft are now routinely inducted for overhaul within 24 hours of their arrival from an operational unit.

However, we found that this was not always the case. We examined Alameda's scheduling records for the period October 1, 1986, to April 15, 1987. We found that 5 of 12 P-3 aircraft received during that period waited more than 24 hours to be inducted. The average wait time was 7 days, which is an improvement over fiscal year 1985. For all aircraft received at Alameda during that period, we found that 21 of 39 aircraft waited more than 24 hours to be inducted. The average wait time was 15 days. The above data indicate to us that scheduling problems still exist and the Navy continues to need to give more attention to solving these problems.

Labor Resources Can Be Applied More Efficiently

Depots can reduce turnaround time by concentrating their available labor forces on fewer aircraft. Currently, the depots spread available workers over as many aircraft as they can fit into the production line. If the depots were to concentrate their workers on fewer aircraft, they could finish work on each aircraft sooner and, over time, complete just as many aircraft. Since the depots apply labor on a predominately single-shift basis, considerable flexibility exists for using limited second shifts in those cases where work space becomes a constraining factor in achieving optimum concentration of resources.

The following hypothetical example illustrates how labor can be concentrated to reduce turnaround time. Assume that an aircraft repair facility has 20 workers, it takes 8,000 direct labor hours to overhaul an aircraft (not the P-3), each worker works an 8-hour day, and two aircraft need overhauling. As the Navy typically operates, both aircraft are brought into the depot on day 1 and 10 workers are assigned to each aircraft. At the rate of 80 hours of labor a day (10 workers working 8 hours), each aircraft takes about 100 workdays to overhaul.

Instead, the repair facility could bring in aircraft A on day 1 and apply all 20 workers to that aircraft. At the rate of 160 direct labor hours each day (20 workers working 8 hours), aircraft A could be returned to service on workday 50. Aircraft B, which remained in operation while aircraft A was being overhauled, could then be brought into the depot, overhauled in 50 days, and returned to service on workday 100. Each aircraft would be in the depot for 50 days. Or, if space is inadequate for all 20 workers to work on an aircraft at a time, up to 10 workers, which could not be applied on the first shift, could work a second shift to achieve 160 direct labor hours per day, thereby accomplishing an 8,000-hour overhaul in 50 workdays. Again, aircraft B would remain in service until workday 51 and each aircraft would be in the depot only 50

workdays. The overall rate of production, however, would be unchanged. At the end of 100 workdays, two aircraft would be overhauled—regardless of which procedure is used. But concentrating labor allows each plane to minimize its time at the depot.

This hypothetical example does not include certain practical complexities, such as specialization among Navy workers. Nevertheless, the principles of concentrating existing labor resources on fewer aircraft are applicable in practice.

One actual example where applying more personnel on fewer aircraft could reduce turnaround time involves the repair of fuel tanks. Jacksonville's overhaul plan for pressure testing and repairing P-3 fuel tanks calls for two metalworkers to complete the task in 8 workdays. This is a critical task—an aircraft cannot move to the next step in the process until a fuel tank has been repaired. By transferring an additional two metalworkers from noncritical tasks to the fuel tank task, 4 of the 60 metalworkers on the P-3 production line could be assigned to complete this task. Jacksonville then could halve the time required to test and repair each tank, saving 4 workdays in overhauling the P-3. The noncritical tasks subsequently could be done concurrently with other overhaul tasks.

At Alameda, similar opportunities exist. Alameda has seven P-3 workstations on its production line. When the production line is full, evaluation engineers are working on one to two aircraft, metalworkers are working on two to three aircraft, and mechanical and electrical workers are working on three aircraft. By redistributing its workers, Alameda could reduce turnaround time by 50 percent or more. For example, the metalworkers in the structural tanks and structural fuselage shops work on two to three aircraft for 16 workdays to complete their portions of the overhaul. If the metalworkers were combined to work on one aircraft, using two shifts if workspace were a constraining factor, structural tanks could be finished in 4 workdays and structural fuselage in another 4 workdays, thereby reducing turnaround time by 8 workdays. The same potential exists for reducing the time required for the other shops.

To estimate the overall potential for speeding up the entire overhaul process at Alameda, we assumed that all of the existing labor resources could similarly be concentrated on four aircraft instead of the current seven aircraft. This action would reduce the number of workdays

required to perform the production line tasks from 56 to 32 workdays per aircraft.

We asked Navy officials about the advantages and disadvantages of concentrating existing labor resources on fewer aircraft. They stated that this action would reduce turnaround time and achieve other efficiencies, such as increased utilization of equipment. Disadvantages cited include less flexibility to react to unexpected requirements, shift efficiency degradation if multiple shifts are used, and increased costs for pay differentials if multiple shifts are needed. The officials stated that multiple shifts already are used to a limited extent in operations where facility, environmental, or process constraints exist. In addition, we found that depots concentrate labor resources on an individual aircraft when an expedite order is received on that aircraft.

In its comments, DOD stated that presently there are limitations on how much overhaul turnaround times can be reduced by concentrating labor resources without first taking action to improve material availability. DOD stated that the depots have embarked upon a series of initiatives aimed at ensuring that aircraft production lines are operated effectively and efficiently. One of these initiatives is focused on improving material availability. According to DOD, when fully implemented, all of these initiatives are expected to achieve the results we desire.

We agree that implementing these initiatives should improve depot operations. However, none of the initiatives deal with concentrating labor resources on fewer aircraft. We believe that, once the material availability initiative is far enough along, a concentration of labor resources initiative should be undertaken to bring about further improvements.

Depots Have Excess Overhaul Capacity

The Navy has more production capacity than it needs to overhaul P-3 aircraft through the year 2005. This excess capacity results in redundancies and causes unnecessary duplication in such areas as spare parts, supplies, and equipment, as well as in management, administrative, and other support costs.

Department of Defense Directive 4151.1 provides guidance for sizing maintenance facilities. The directive states that a facility should be large enough to accomplish 100 percent of the projected peacetime workload on a single-shift, 40-hour work week basis.

The annual single-shift capacities of the three depots that overhaul P-3 aircraft are shown in table I.1.

Table I.1: Annual P-3 Overhaul Capacity

Depot	Number of aircraft
Alameda	28
Jacksonville	66
Lake City	40
Total	134

Operating differences at the depots may cause some changes in the single-shift capacities shown.

The anticipated workload is considerably less than the single-shift capacity of the depots. According to Deputy Chief of Naval Operations (Air Warfare) officials, the projected P-3 overhaul workload for fiscal years 1987 to 1992 ranges from 79 to 99 aircraft. This workload represents 59 to 74 percent of the minimum single-shift capacity of 134 aircraft. Since Navy officials have stated that the P-3 force is expected to remain at current levels through 2005, none of the excess capacity appears to be needed to meet increased levels of overhauls throughout the remainder of this century.

In December 1986, Naval Aviation Logistics Center officials told us that the Lake City contract had been terminated because performance was unsatisfactory. They stated that they were seeking another contractor to perform P-3 overhauls, starting as early as the third quarter of fiscal year 1987.

In commenting on our draft report, DOD stated that there is no excess P-3 overhaul capacity at the Alameda and Jacksonville depots. DOD indicated that capacity should be expressed in terms of direct labor hours, not in numbers of units produced. We used the number of P-3 aircraft that could be overhauled as the capacity because that was the way the capacity information was presented to us by the Deputy Chief of Naval Operations (Logistics). However, this capacity can be converted to direct labor hours by applying labor hour norms established by the Navy for individual P-3 overhauls. This conversion results in a combined P-3 capacity of 901,000 direct labor hours for the Alameda and Jacksonville depots. The capacity is considerably larger than the maximum projected

workload of 637,000 direct labor hours cited in DOD's comments. Further, DOD's comments did not recognize the capacity of the third P-3 production line to be established at a commercial depot. Therefore, it appears that a significant amount of excess P-3 capacity will continue to exist.

Comments From the Assistant Secretary of Defense (Production and Logistics)

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



ASSISTANT SECRETARY OF DEFENSE

WASHINGTON, D.C. 20301-8000

Production & Logistics

L(MD)

APR 24 1987

Mr. Frank C. Conahan
Assistant Comptroller General
National Security and International
Affairs Division
U.S. General Accounting Office
Washington, DC 20548

Dear Mr. Conahan:

This is the Department of Defense (DoD) response to the General Accounting Office (GAO) Draft Report, "NAVY MAINTENANCE: Planning For P-3 Aircraft Overhauls Can Be Improved," dated January 21, 1987 (GAO Code 394086, OSD Case 7214).

With the exception of the excess capacity issue, the Department generally agrees with the GAO findings and recommendations and notes that actions have already been taken or are underway.

The detailed DoD comments on each finding and recommendation are provided in the enclosure. Thank you for the opportunity of commenting on the draft report.

Sincerely,

A handwritten signature in ink, appearing to read "R. B. Costello", is written over a pre-printed name.

Robert B. Costello

Enclosure

GAO DRAFT REPORT - DATED JANUARY 21, 1987
(GAO CODE 394086) OSD CASE 7214

"NAVY MAINTENANCE: PLANNING FOR P-3 AIRCRAFT OVERHAULS
CAN BE IMPROVED"

DEPARTMENT OF DEFENSE COMMENTS

* * * * *

FINDINGS

FINDING A: Inspections Needed To Ensure Overhauls Are Necessary. The GAO reported that the Navy has established the Aircraft Service Period Adjustment (ASPA) program to inspect aircraft before they are due for overhaul to determine whether overhauls can be deferred for 12 months. The GAO found that between January 1984 (when inspections of P-3 aircraft began under the ASPA program) and December 1985, depot engineers inspected 152 aircraft and 85 aircraft (56 percent) were given 12 additional months to continue in operation without overhaul. The GAO also found, however, that squadrons forwarded 68 P-3s to depots during FY 1985, 35 without assurance that an overhaul was needed. The GAO reported that it asked command officials why they did not request pre-overhaul inspections on all P-3 aircraft, and were told that the aircraft were in such obvious need of overhaul, an inspection would be a waste of funds. According to the GAO, however, depot officials stated that the squadrons lack the expertise to decide whether an overhaul is necessary and that depot personnel are much better qualified to make this judgement. The GAO pointed out that, according to the Alameda Naval Air Rework Facility, the cost of an ASPA program inspection is approximately \$6000. The GAO observed that, in contrast, the average cost of an overhaul is about \$715,000. The GAO calculated, therefore, that if inspections had been required and the historic rate of overhaul deferrals (56 percent) had been achieved: (1) 20 of the 35 aircraft would have passed inspection and remained in the squadron for another year and (2) the Navy would have saved over \$14 million in overhaul costs in FY 1985, if the 20 aircraft had not been overhauled (20 times the difference between the cost of overhaul, \$715,000, and the cost of inspection, \$6,000). The GAO concluded that the Navy could reduce both aircraft procurement requirements and overhaul costs by performing more inspections to determine if overhauls are necessary. The GAO further concluded that even if only one inspection in 100 resulted in deferring an overhaul, the Navy would save funds because the \$6,000 inspection cost is less than one percent of overhaul cost. (pp. 1-2, pp. 9-12/GAO Draft Report)

Now on pp. 1, 7, 8, and 9.

DoD Response: Partially concur. An analysis of the 35 P-3 aircraft, which the GAO reported were forwarded to depots during FY 1985 without receiving an ASPA inspection prior to induction, shows the following:

- seven did receive an ASPA inspection and were not deferred;
- six received major aircraft modifications and therefore, were exempt from ASPA;
- four did not come under the ASPA program until after their date of induction and, therefore, were exempt from ASPA;
- four had been extended when the ASPA program commenced and, therefore, were exempt from ASPA;
- nine aircraft were in poor material condition and the type commander used appropriate judgement in exempting them from an ASPA inspection;
- two aircraft were needed to facilitate stand up of new squadrons and the type commander used appropriate judgement in exempting them from an ASPA inspection;
- two were needed to satisfy special operational requirements and the type commander used appropriate judgement in exempting them from an ASPA inspection; and
- one was exempted by a type commander for safety considerations.

As shown by the analysis, there are valid reasons why some aircraft were not inspected. Accordingly, the Department cannot agree that 20 of the 35 aircraft would have passed inspection and remained in the squadron for another year. As a result, the Department also cannot agree that the Navy would have saved \$14 million in overhaul costs in FY 1985.

The Department also points out that: (1) a more accurate estimate of the cost of an inspection is \$15,000, including the labor hours expended by organizational-level and depot-level personnel in the fix-phase of an ASPA inspection and (2) the P-3 aircraft inventory is not and never has been sufficient to meet both operational and maintenance pipeline requirements. Hence, any reductions to

See comment 1.

Navy procurement budgets, as long as these shortages exist, would be detrimental.

FINDING B: Overhauls Can Be Scheduled More Efficiently.

The GAO noted that the Naval Aviation Logistics Center is responsible for scheduling aircraft overhauls at the depots. The GAO observed that, through quarterly workload conferences with major commands and depots, the Center allocates projected overhauls among the depots on a quarterly basis. According to the GAO, aircraft are supposed to be delivered the day before the scheduled overhaul date. The GAO found, however, that the major commands and their squadrons frequently request modifications to the quarterly schedule before actually delivering aircraft to the depots and the Logistics Center routinely approves them. The GAO also found that the lack of adequate central control over actual aircraft deliveries has resulted in haphazard work flow and inefficiencies. Specifically, the GAO found that during the last two quarters of FY 1985: (1) the Alameda depot received 26 P-3s but only had a capacity to overhaul 19 -- causing an average wait of 74 days before starting the overhaul; and (2) the Jacksonville depot received 18 P-3s but had a capacity to overhaul 31--causing the production line to operate at only 58 percent of capacity. The GAO found that ineffective scheduling of overhauls caused P-3s to sit outside the hangar awaiting overhaul for an average of 14 days in FY 1985. The GAO observed that the Navy purchases a number of aircraft beyond those it needs to have in operation at a given time to compensate for the time aircraft spend in a depot. The GAO further observed that as the time spent in a depot increases (turnaround time), the total number of aircraft needed to sustain operations increases. According to the GAO, if the average turnaround time increased by 3.5 days for the P-3, one additional aircraft would have to be purchased at a cost of \$36 million to assure that the average number of operational aircraft did not decrease. In total therefore, the GAO calculated that the 14 day awaiting time equates to an additional four aircraft (14 days divided by 3.5 days) at a cost of \$144 million (4 times \$36 million). The GAO concluded, therefore, that the Navy could reduce both aircraft procurement requirements and overhaul costs by scheduling overhauls more efficiently. The GAO further concluded that the Logistics Center needs to refine the aircraft overhaul delivery date as it approaches and determine the exact date that an aircraft should be delivered to a depot, with the following factors taken into consideration: (1) each aircraft's overhaul due date, (2) each squadron's operational needs, (3) each depot's capacity to begin work when the aircraft is delivered, and (4) variances in work required on each aircraft. (pp. 1-2, pp. 7-8, pp. 12-15/GAO Draft Report)

Now on pp. 1, 6, 9, 10, and 11.

DoD Response: Partially concur. As the GAO noted, during FY 1985 there was a problem at NARF Alameda, which resulted in more aircraft arriving than could be overhauled. The impact was lessened by diverting Alameda scheduled P-3s to NARF Jacksonville. Consequently, backlogs were eliminated within six months. Currently, all P-3 aircraft are routinely inducted within 24 hours of their arrival from the operational unit. If the unusually long turnaround time experienced at Alameda during FY 1985 had introduced a significant error in the computation of the annual procurement requirements for all types of Navy P-3 aircraft, it would be appropriate to reduce P-3 procurements as recommended by the GAO. However, this was not the case. The Department also points out that P-3 aircraft procurements have never been adequate to fill all operational, training and maintenance requirements. Therefore, when a P-3 goes into overhaul, the losing activity is forced to operate below its authorized level of P-3 aircraft.

FINDING C: Labor Resources Can Be Applied More Efficiently. The GAO reported that currently, the overhaul depots (1) spread available workers over as many aircraft as can fit into the production line, and (2) apply labor on a predominately single-shift basis. The GAO described a hypothetical example wherein (1) more workers would be assigned at the same time to fewer aircraft to reduce overhaul time while at the same time keeping other aircraft operational, or alternatively (2) workers could be assigned on first and second shifts to achieve the same goals if the workers could not work on the same aircraft at the same time. The GAO recognized the hypothetical example does not include certain practical complexities, such as specialization among Navy workers, but the GAO reported two specific examples of potential opportunities to reduce overhaul time, as follows:

- at Jacksonville, combining metalworkers who perform noncritical tasks with those who repair P-3 fuel tanks would save 4 workdays for such repairs; and
- at Alameda, reassigning metalworkers from working on two to three aircraft to working on one aircraft would save eight workdays in the structural tanks shop and structural fuselage shops.

According to the GAO, the same potential exists for reducing the time required for other shops. The GAO estimated the overall potential for speeding up the entire overhaul process at Alameda by assuming that all existing labor resources could be concentrated on four aircraft instead of the current production line capacity of seven aircraft. The GAO calculated that 24 workdays would be saved, which equates to 36 calendar days. The GAO observed that the Navy purchases aircraft beyond those it needs to have in operation to compensate for the time aircraft spend in a depot. The GAO further observed that as the time spent in a depot increases (turnaround time), the total number of aircraft needed to sustain operations increases. According to the GAO, if the average turnaround time increased by 3.5 days for a P-3, one additional aircraft would have to be purchased at a cost of \$36 million to assure that the average number of operational aircraft did not decrease. The GAO concluded that (1) 10 fewer aircraft (36 days divided by 3.5 days) would have to be procured because they would be available for operations rather than being tied-up at the depot undergoing overhaul, and (2) these 10 aircraft represent \$360 million in savings (10 times \$36 million). The GAO further concluded that the Navy could reduce both aircraft procurement requirements and overhaul costs by concentrating labor resources on fewer aircraft. (pp. 1-3, pp. 7-8, pp. 15-18/GAO Draft Report)

DoD Response: Partially concur. The P-3 aircraft inventory shortfalls (discussed in Finding B) provide a large incentive to the air rework facilities to reduce the turnaround time wherever possible to return much needed aircraft to fleet users as quickly as possible. For example, the air rework facilities already do, as suggested by the GAO, apply labor concentrations at potential choke points. For instance, NARF Alameda currently runs a three-shift operation in the paint shop, and two 12-hour shifts in the flight test area to prevent these two work areas from becoming bottlenecks. However, there are limitations on how much turnaround time can be reduced by taking measures involving labor resources alone. For example, the "critical driver" on the P-3 is the main landing gear. Its 80-day turnaround time exceeds that of the air frame by 7 days, thus limiting the value of any turnaround reduction on the airframe rework. A Naval Air Rework Facilities management analysis was completed in February 1986. As a result, the NARFs have embarked upon a series of initiatives aimed at ensuring that aircraft production lines are operated effectively and efficiently. One of these is focused on improving material availability to reduce cannibalization and back-robbing. When fully implemented, all of these initiatives are expected to achieve the results desired by the GAO, as well as make each NARF more competitive.

FINDING D: Depots Have Excess Overhaul Capacity. The GAO reported DoD Directive 4151.1 states that a depot facility should be large enough to accomplish 100 percent of the projected peacetime workload on a single-shift, 40-hour work-week basis. According to the GAO, the annual single-shift capacity totals 134 aircraft for the three depots that overhaul P-3 aircraft: 28 for Alameda, 66 for Jacksonville and 40 for Lake City. The GAO pointed out, however, that according to officials in the Office of the Deputy Chief of Naval Operations (Air Warfare) the projected P-3 overhaul workload for FY 1987 to FY 1992 ranges from 79 to 99 aircraft. The GAO noted that in December 1986, Logistics Center officials told the GAO that the contract to perform P-3 overhauls at Lake City had been terminated because performance was unsatisfactory. The GAO further noted, however, these Center officials also stated that they were seeking another contractor to perform P-3 overhauls, starting as early as the second quarter of FY 1987. The GAO also pointed out that Navy officials have stated that the P-3 force is expected to remain at present levels through 2005. The GAO concluded that the Navy has more production capacity than it currently needs, and that none of the excess capacity appears to be needed through the year 2005. The GAO further concluded that this excess capacity results in extensive redundancies and causes unnecessary duplication in such areas as spare parts, supplies, and equipment, as well as in management, administrative, and other support costs. (p. 1, p. 3, pp. 19-20/GAO Draft Report)

DoD Response: Nonconcur. DoD 4151.15-H, the "Depot Maintenance Production Shop Capacity Measurement Handbook", provides guidance and procedures for a common methodology to measure capacity in the DoD depot maintenance activities. Using the handbook, capacity is expressed in terms of direct labor hours, not in numbers of units produced, as the GAO has done. The table below summarizes total P-3 aircraft workload (expressed in labor hours) including SDLM, conversions, repairs and conversions planned for organic accomplishment during FY 1986 through FY 1989. The data indicate that P-3 workload increases 34 percent from FY 1986 to FY 1989. The table below also shows that overall airframe workload planned for NARFs Alameda and Jacksonville increases 25 percent during this period. Further, P-3 workload as a percent of the total airframe workload at these NARFs, increases from 23 percent in FY 1986 to 27 percent in FY 1989. Hence, the Department does not agree that there is any excess P-3 overhaul capacity at these two NARFs.

TOTAL AIRFRAME
and P-3 WORKLOAD
at NARF's ALAMEDA AND JACKSONVILLE
(in thousands of labor hours)

	FISCAL YEAR			
	1986	1987	1988	1989
Total Airframe	2,099	2,151	2,270	2,380
P-3 Only	473	480	561	637
P-3 Workload as a Percent of Total	23	22	25	27

FINDING E: Applicability of Procedural Changes To Other Aircraft. The GAO observed that the P-3 aircraft has one of the shortest overhaul turnaround times among Navy aircraft and any procedural changes to reduce that time could have applicability to other aircraft, particularly those with longer turnaround times. The GAO indicated that the Secretary of the Navy should determine the feasibility of implementing for other aircraft, as follows:

- require all aircraft be inspected to determine if overhauls are needed;
- schedule deliveries of aircraft for overhaul to coincide with a depot's ability to work on that aircraft;
- reduce overhaul time by combining labor on fewer aircraft; and
- eliminate excess aircraft overhaul capacity. (p. 4/GAO Draft Report)

DoD Response: Partially Concur. There are valid reasons why some aircraft are not inspected (as discussed in the DoD response to Finding A). The Department will, however, ensure that explicit guidelines are in place to clarify program exception policies. In the Department's view, scheduled deliveries of aircraft for overhaul already coincide, for the most part, with each NARF's ability to work on that aircraft. For example, the P-3 aircraft is inducted within 24 hours after aircraft arrival. The air rework facilities already apply labor concentrations at

potential choke points; however, at this time there are limitations on how much turnaround times can be reduced without first taking action to improve material availability. Initiatives have been undertaken to improve this area. Finally (as discussed in the DoD response to Finding D), the Department does not agree that there is any excess overhaul capacity in the NARF community.

RECOMMENDATIONS

RECOMMENDATION 1: The GAO recommended that the Secretary of the Navy require that all P-3 aircraft due for overhaul be inspected under the Aircraft Service Period Adjustment program. (p. 3/GAO Draft Report)

DoD Response: Partially concur. There are good reasons for an aircraft not to receive an ASPA inspection in every case, prior to overhaul. Accordingly, the Department does not require all aircraft to arbitrarily receive an ASPA inspection regardless of circumstances. Rather, the Department allows the type commanders some operational flexibility. However, the Department will clarify the policy guidance contained in OPNAVINST 3110.11 that pertains to when an inspection exception is authorized. Included in this revision will be provisions for a "short-cut" method to permit depot personnel to verify a type commander's decision that an ASPA inspection is unnecessary before sending an aircraft to the depot. This action is expected to be completed by June, 1988.

RECOMMENDATION 2: The GAO recommended that the Secretary of the Navy direct the Naval Aviation Logistics Center to assume a more active role in coordinating actual deliveries of P-3 aircraft for overhaul, so each aircraft can be scheduled on a specific date to coincide with a depot's ability to begin work on that aircraft. (p. 3/GAO Draft Report).

DoD Response: Partially concur. Actions were taken to correct the scheduling problems reported by the GAO and the Navy is placing appropriate emphasis on each aircraft's overhaul due date, each squadron's operational needs, each depot's capacity to begin work, and variances in work required on each aircraft. Currently, all P-3 aircraft are routinely inducted within 24 hours of their arrival from the operational unit.

RECOMMENDATION 3: The GAO recommended that the Secretary of the Navy explore opportunities to reduce overhaul turnaround time by concentrating labor resources at the depots on as few P-3 aircraft as possible. (p. 4/GAO Draft Report).

DoD Response: Partially concur. At the present time, there are limitations on how much turnaround times can be reduced by taking measures involving labor resources alone. A Naval Air Rework Facilities management analysis was completed in February 1986. As a result, the NARFs have embarked upon a series of initiatives aimed at ensuring that aircraft production lines are operated effectively and efficiently. One of these is focused on improving material availability to reduce cannibalization and back-robbing. When fully implemented, all of these initiatives are expected to achieve the results desired by the GAO, as well as make each NARF more competitive.

RECOMMENDATION 4: The GAO recommended that the Secretary of the Navy examine ways to eliminate excess P-3 aircraft overhaul capacity at the depots, perhaps by closing one of the P-3 aircraft production lines. (p. 4, GAO Draft Report).

DoD Response: Nonconcur. The Department does not agree that there is any "excess" aircraft overhaul capacity in the NARF community. (See DoD Response to Finding D.)

RECOMMENDATION 5: The GAO recommended that the Secretary of the Navy determine the feasibility of implementing the above recommendations on other aircraft. (p. 4, GAO Draft Report).

DoD Response: Concur. Actions have already been taken and are underway. Current management initiatives, begun as a result of the NARF management analysis completed in February 1986, will help ensure that all aircraft production lines are operated effectively and efficiently, including turnaround time reductions where possible and practical.

The following is GAO's comment on the DOD letter dated April 24, 1987.

GAO Comment

1. In its comments, DOD stated that the P-3 aircraft inventory has never been sufficient to fill both operational and maintenance requirements and, therefore, any procurement reductions would be detrimental. We recognize that because P-3 requirements are above the current inventory, reductions in quantities to be procured are unlikely. We, therefore, have modified the report to remove any inference that we were calling for such reductions.

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